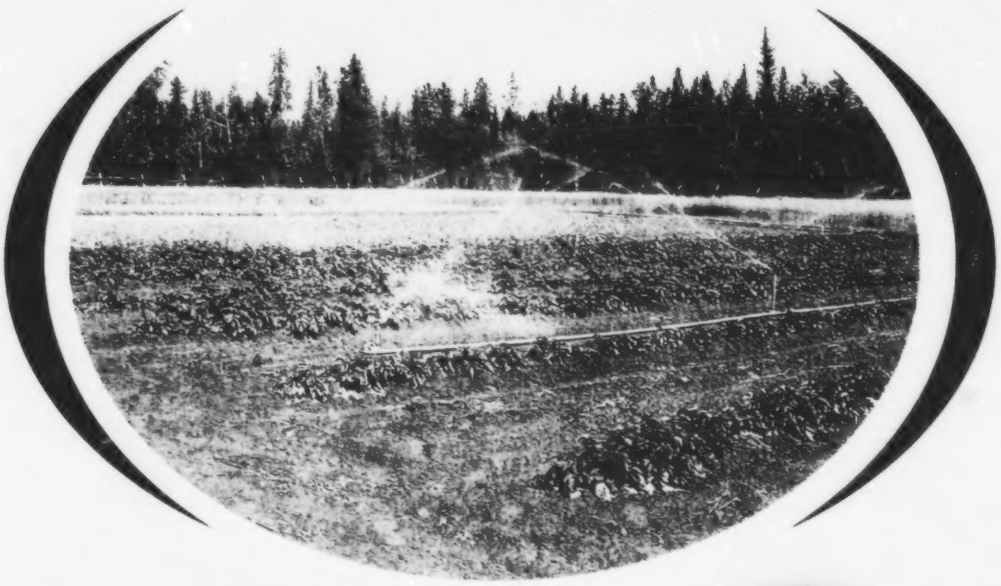
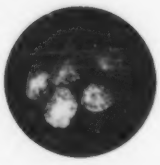
Yukon Agriculture Research & Demonstration Report





2001 Field Season

Yukon
Renewable Resources
Agriculture Branch

PR-01-03

Yukon Agriculture
Research and Demonstration Report

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Progress Report
2001 Field Season

Executive Summary

Takhini Forestry Farm Demonstration Plot

The 2001 growing season was the third year in a four-year grain maturity trial undertaken at the Takhini Forestry Farm. The purpose of this trial is to measure the economics of production together with management inputs required to mature grain in southern Yukon. A horticultural cash crop of potatoes and turnips were also grown at the Forestry Farm to test different varieties and determine profitability.

The growing degree day (GDD) rating for the 2001 season at the Forestry Farm was Class 5 (700-900 GDD) – which falls in the 30-year normal classification for this area.

This year's horticulture crop consisted of "Red Pontiac" potatoes and three varieties of turnips. This years potato harvest provided the most lucrative yield in seven years of trials at this site exceeding last years best crop of "Norland" by over 15%. The turnips that were germinated under IRT wave selective mulch provided the highest percentage of marketable vegetables when compared to other treatments. Of the three varieties; "Laurentian", "Early Snowball" and "Purple Top", the Purple Top variety provided the highest yield overall.

The barley crop was grown for 132 days. The barley plot produced a marketable harvest of 4.1 tonne/ha. At a local selling price of $298.00/tonne, this produced a net profit of $578.56/ha.

The wheat plot produced a marketable harvest of 1.75 tonne/ha. At a local selling price of $310.00/tonne, the net loss was $-103.83/ha. The wheat harvested would suffice for feed although it was very poor seed quality due to the immaturity of the crop.

The oat plot was sampled on September 13th when the oat grain was in the soft to medium dough stage of maturity. This plot produced a marketable harvest of 5.6 tonne/ha. At a local selling price of $302.00/tonne, the net return was $1056.54/ha.

Small Fruit Trials

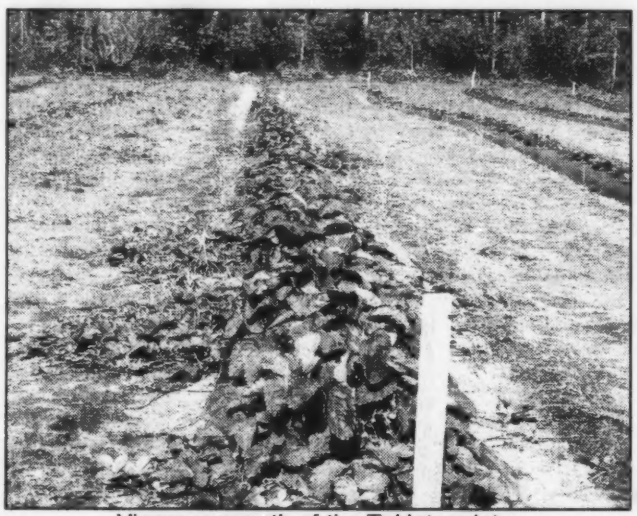
The summer of 2001 was the fourth growing season in a multi-year raspberry variety trial undertaken at a farm located on the north side of the Takhini River. The purpose of the trial is to test the commercial viability of raspberry varieties using various soil amendment techniques. Soil reaction to the various amendments is being recorded together with the economic input, which will provide an estimate of the commercial value of the amendments.

Despite the mild winter of 00/01, many of the over-wintering florocanes did not produce fruit. The exception to this was the "Kiska" variety out of Alaska which had experienced less winterkill the previous winter and had displayed the most plant vigour in the 2000 growing season.

On August 8th the final variety assessment was conducted. Kiska displayed the most plant vigour, both in terms of plant re-growth and as the only variety to produce fruit in any quantity. The Honey Queen variety produced a small amount of fruit as well. The usually reliable Boyne variety did not produce fruit, and slipped to second place in terms of plant vigour. One variety, Red River was dropped from commercial evaluation and two new varieties from the University of Saskatchewan , SK Red Mammoth and SK Red Bounty were added for evaluation starting in 2002.

At the beginning of the 2000 growing season, six varieties of strawberries were planted to be tested for their viability in the southern Yukon. The varieties tested were Bounty, Cavendish, Glooscap, Honeyoye, Kent and Toklat. Input on trial design and mulching techniques was provided from a commercial producer near Fairbanks. Twelve rows were planted with 3 meter spacing between the rows and 45 cm spacing between each plant. Infrared transmissive plastic mulch was laid over each planting bed with the hope that this mulch would allow soil warming while effectively controlling weed growth. Within three weeks of transplanting, several of the plants had died or showed signs of stress with a resulting loss of some plants. In 2001, replacement plants were added to the rows and three new rows of Toklat were added to the trial.

The Toklat variety (from Alaska) produced the most vigorous growth, the most runners and the most fruit in the 2001 season. Other observations included the excessive weed growth under the IRT mulch that was not supposed to occur and the taste that the farm owner's dogs acquired for ripening fruit. Quantitative fruit assessments will begin in 2002.



Vigorous growth of the Toklat variety

Table of Contents

Executive Summary i

Takhini Forestry Farm Demonstration Plot

Site Description 1
- Agrometeorology 1
- Site Preparation and Plot Design 3
- Soils 4

Trial Description and Results 5
- Horticulture Trial
  - Field 1: Potatoes 5
  - Field 1: Rutabagas and Turnips 6
- Cereal Maturity Trials 7
  - Field 2: Barley 8
  - Field 3: Wheat 9
  - Field 4: Oats 10

Small Fruit Trials

Introduction 11
Site Description 11
Raspberry Variety Trials 12
Strawberry Variety Trials 13

References 16
Appendix A: Potato and Turnip Variety Descriptions 17
Appendix B: Grain Variety Descriptions 18
Appendix C: Raspberry Variety Descriptions 19
Appendix D: Strawberry Variety Descriptions 20

LIST OF TABLES

Table 1: Definitions and Operational Constraints of Land Capability Classes for Cultivated Agriculture in Yukon Territory 2
Table 2: Agroclimatic Data for 2001 at the Takhini Test Plots 3
Table 3: Summary Weather Data from the Takhini Test Plots (1995-2001) 3
Table 4: Horticulture Crops – Potatoes 5
Table 5: 2001 Horticulture Harvest Results – Potatoes 6
Table 6: Horticultural Crops - Turnips 6
Table 7: Grain Trial – Barley 8
Table 8: 2001 Barley Harvest Results 9
Table 9: Grain Trial – Wheat 9
Table 10: 2001 Wheat Harvest Results 10
Table 11: Grain Trial – Oats 10
Table 12: 2001 Oat Harvest Results 11
Table 13: Small Fruit Trials Temperature Data 15

LIST OF FIGURES

Figure 1: Takhini Forestry Farm Plot Layout 2001 4
Figure 2: Raspberry Plot Layout 2001 12
Figure 3: Strawberry Plot Layout 2001 14

LIST OF PHOTOS

Photo 1: Vigorous growth of the Toklat variety ii
Photo 2: Takhini Horticulture Plot August 2001 1
Photo 3: 1950s Allis Chalmers 4-row seeder 2
Photo 4: Oats at the Takhini Test Plot August 2001 7
Photo 5: Takhini Barley Plot August 2001 8
Photo 6: Cavendish vs Toklat berries 14

TAKHINI FORESTY FARM DEMONSTRATION PLOT

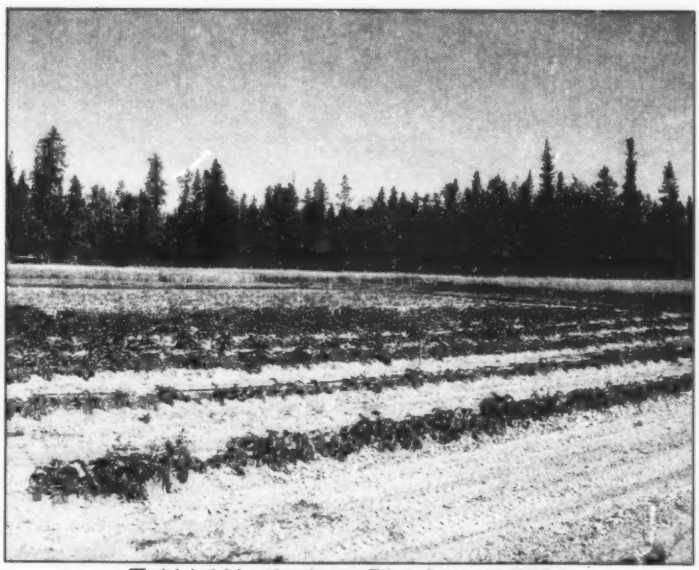
The 2001 growing season marked the third year in a four-year grain maturity trial undertaken at the Takhini Forestry Farm. The grain trial looks at the performance of different early maturing varieties, grown under irrigated conditions together with various production methods used to improve variety performance in this area. The purpose of this trial is to measure the economics of production and management inputs required to mature grain in the southern Yukon.

A cash crop of potatoes and turnips were also grown at the Forestry Farm to test different varieties and determine profitability. This section of the report describes the 2001 field season and the overall findings of the grain maturity and cash crop trials.

SITE DESCRIPTION

AGROMETEOROLOGY

Climate is the major limiting factor to agriculture in the Yukon because of the short frost free period and lack of heat units during the growing season. Agroclimatic capability ratings are a measure of the degree of limitation imposed by climate on agricultural production. These ratings are derived from 30-year normal data collected by Atmospheric Environment Services of Environment Canada. They represent a measure of the amount of heat available to crops during the growing season. The agroclimatic rating is modified to account for local climate patterns, such as frost occurrences, which affect the length of the growing season. As shown on Table 1, agroclimatic classes range from Class 1 (no restrictions) to Class 7 (unable to be used for any agricultural purpose).

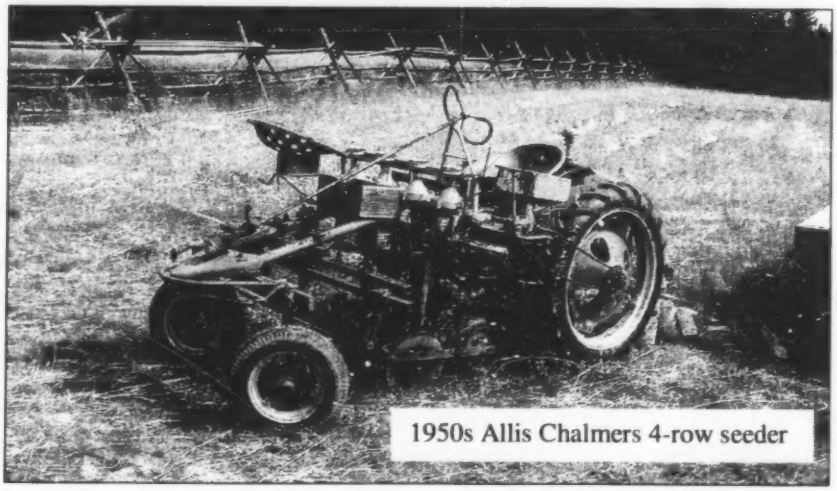


Takhini Horticulture Plot August 2001

Table 1
Definitions and Operational Constraints of Land Capability Classes for Cultivated Agriculture in Yukon Territory (Tarnocai et al. 1988)

Class 1 1400-1600 GDD	These lands have no significant limitations that restrict the production of the full range of common Canadian agricultural crops (none in Yukon).
Class 2 1200-1400 GDD	These lands have slight limitations that restrict the range of some crops but still allow the production of grain and warm season vegetables (none in Yukon, based on a 30 year average).
Class 3 1050-1200 GDD	These lands have moderate limitations that restrict the range of crops to small grain cereals and vegetables (in a few localized areas in Yukon).
Class 4 900-1050 GDD	These lands have severe limitations that restrict the range of crops to forage production, marginal grain production and cold-hardy vegetables (valleys of central Yukon).
Class 5 700-900 GDD	These lands have very severe limitations that restrict the range of crops to forages, improved pastures and cold-hardy vegetables (the most common class of agricultural land in Yukon).
Class 6 <700 GDD	These lands have such severe limitations for cultivated agriculture that cropping is not feasible. These lands may be suitable for native grazing.
Class 7	These lands have no capability for cultivated agriculture or range for domestic animals.

The number of growing degree days (GDD) are calculated beginning the fifth consecutive day with mean temperatures above 5°C, and terminated the day following the first killing frost (-2.2°C) which occurs after mid-July. During the 2001 growing season, the weather station at the Takhini test plot recorded 709.9 growing degree days. When corrected for latitude, this becomes 837.7 effective growing degree days (EGDD). The first killing frost occurred on Aug 24th. The agroclimatic rating for 2001 was Class 5 (700-900 EGDD), which is one class to low for the maturation of oats, barley and rye. This rating is the normal agroclimate classification for this area (see Table 2).



1950s Allis Chalmers 4-row seeder

Table 2
Agroclimatic Data for the 2001 Growing Season at the Takhini Test Plots

Climate Factor	May	June	July	August	Total
Max Temp (°C)	17.5	24.5	30.8	27.7	
Min Temp (°C)	-7.9	-2.8	0.7	-2.4	
Daily Mean (°C)	5.5	12.5	13.4	12.7	
30 Year Normal	6.7	12.0	14.1	12.5	
Total Precipitation (mm)	18.0	72.1	35.0	33.7	158.7
30 Year Normal	12.9	30.7	33.6	37.9	115.1
Growing Degree Days (>5°C)	28.1	225.9	260.1	195.7	709.9
Effective Growing Degree Days	33.2	266.6	307	231	837.7 *
Frost Free Period (0°C)		June 27	→	Aug 17	51 days **
Killing Frost Free Period (-2.2°C)		June 08	→	Aug 24	77 days

* The temperature factor is adjusted upward by 18% to account for the boost plants receive from the long hours of daylight north of 60° latitude.
** Whitehorse Airport records a 30-year mean frost free period of 87 days. This is longer than the 2001 frost free period and most others recorded at the Forestry Farm. The airport site regularly receives winds which tend to keep the temperature above freezing, while the forest sheltered nature of the Takhini Valley site reduces air movement, and therefore frosts are more common.

As shown in Table 3 (below) the effective growing degree days for 2001 are close to average when compared to the past 6 years on record.

Table 3
Summary Weather Data from the Takhini Test Plots (1995-2001)

	1995	1996	1997	1998	1999	2000	2001
Growing Degree Days (>5°C)	728.0	504.0	763.2	823.8	811.1	664.7	709.9
Effective Growing Degree Days (>5°C)	859.0	594.7	900.6	972.1	957.1	784.4	837.7
Frost Free Period (0°C)	44 days	25 days	45 days	35 days	50 days	50 days	51 days
Killing Frost Free Period (-2.2°C)	67 days	50 days	74 days	81 days	85 days	68 days	77 days
Precipitation (mm)	106.6	161.9	124.8	57.4	144.6	179.2	158.7

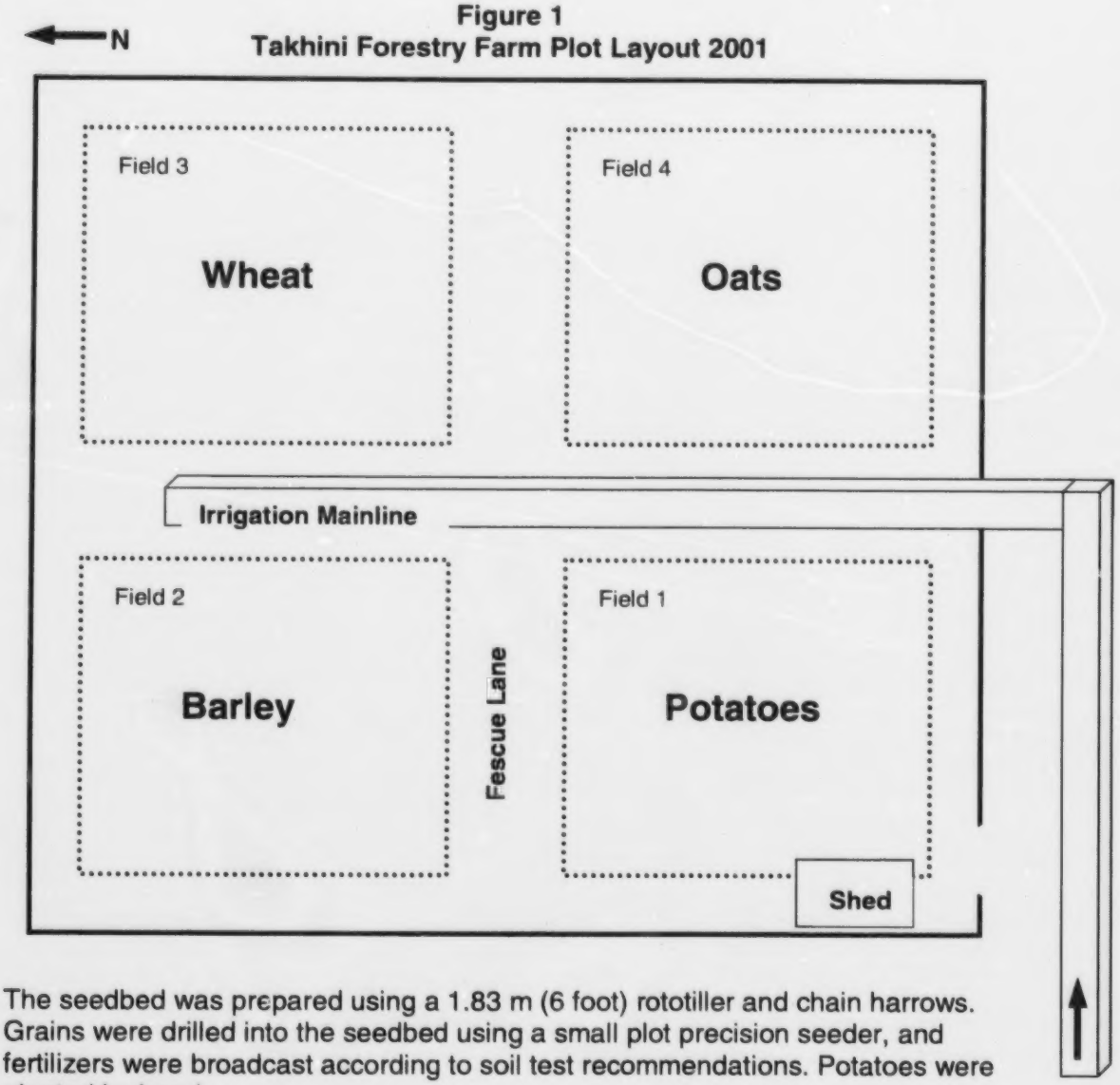
Site Preparation and Plot Design

The agriculture test plots are located at the Federal Forestry Farm situated south of the junction of the Klondike Highway and the Takhini Hotsprings Road. The demonstration plots are located on a level, sheltered 0.98 hectare field which is divided into four 40 m x 35 m test plots (Figure 1). All crops are grown under irrigated conditions. The soil, landscape and climatic properties of the site are typical of those encountered at many farms in the southwest region of the Yukon.

Soils

The fine textured soils at the demonstration plot vary from silt loam to sandy loam, and their potential for agricultural production is rated as fair to good. These soils belong to the Lewes soil association and are characterized as loam, with an average particle size breakdown of 42% sand, 47% silt and 11% clay throughout the four fields. The average soil pH of the three plots this year was 7.0, (neutral) and the average soil organic matter was 1.8%, which is low, and somewhat surprising considering the soil building effort that preceded this trial.

Figure 1
Takhini Forestry Farm Plot Layout 2001



The seedbed was prepared using a 1.83 m (6 foot) rototiller and chain harrows. Grains were drilled into the seedbed using a small plot precision seeder, and fertilizers were broadcast according to soil test recommendations. Potatoes were planted by hand.

Weed control in the horticultural trial consisted of mechanically cultivating between rows and hand roguing. Weeds in the crop rows were also removed by hand roguing.

TRIAL DESCRIPTION AND RESULTS

HORTICULTURE TRIAL

FIELD 1: POTATOES

In 2001, the horticulture trial consisted of seeding of "Red Pontiac," a mid-season red skinned potato variety (see Appendix A). The purpose of the trial was to measure the performance of this particular variety and the economics of production on a per acre basis as compared to "Norland" the previous year.

On May 24th, six 30 meter rows of "Red Pontiac" potatoes where planted with 30 cm spacing between plants. The "Norland" potato variety had an above average yield on this site last year, and this year "Red Pontiac" proved even more lucrative. Overall, the trial yield exceeded our expectations considering the "average" growing conditions.

Table 4
Horticulture Crops – Potatoes

Plot Design	35 x 40 m
Seedbed Preparation	Spring rototilling
Fertilizer Application	88-31-72 kg/ha (79-28-71 lb/ac)
Seed Variety	Red Pontiac
Seeding Date	May 24, 2001
Planting Methods	Hand
Harvest Date	September 12, 2001
Soil Test Date	September 24, 2001
pH	7.0 – neutral
Organic Matter	1.6% - low

The potatoes were fertilized according to soil test recommendations. Irrigation of the horticulture plots occurred five times between May 31st and August 17th, this is the same number of applications as last year. The potatoes were hit twice with light frost (-0.9°C & 0.5°C) on June 24th and June 27th, which did not do any damage to the plants.

Table 5
2001 Horticulture Harvest Results - Potatoes
Cost and Return Summary

Cost:	
Certified Seed	$2,609.59/ha
Fertilizer	$604.91/ha
Irrigation	$259.00/ha
Fuel and Equipment	$429.78/ha
Labour	$1,580.00/ha
Total Cost *	$5,483.28/ha
Return:	
Total Harvest	32,506 kg/ha
Cull and Undersize	5106 kg/ha
Marketable Harvest	27,400 kg/ha
Selling Price	$0.66/kg
Gross Return	$18,084.00/ha
Net Return	$12,600.72/ha

*This cost excludes washing, packaging and marketing.

Horticulture harvest results and economics are presented in Table 5 above.

FIELD 1: RUTABAGAS AND TURNIPS

Three varieties of turnip were added to the horticulture trial in 2001 to compare the performance and yield under different management applications. The variables used were crop covers of either a light weight, translucent woven polyethylene blanket (Remay); a light-wave selective polyethylene mulch used for soil warming and weed control (IRT), and a control treatment with no crop cover for each variety. Results are presented in Table 6.

Table 6
Horticultural Crops - Turnips

	Early Snowball		Purple Top		Laurentian (Swede)		Total (lbs)	
	Good	Cull	Good	Cull	Good	Cull	Good	Cull
Remay	11.05	6.55	22.95	17.5	5.3	7.25	33.9	31.3
IRT	10.85	15.9	31.8	22.0	11.0	9.8	53.65	47.7
Control	7.10	11.5	13.95	18.6	5.6	11.7	26.65	41.8
Total	29.0	33.95	68.7	58.1	21.9	28.75	114.2	120.8

The Purple Top variety was by far the highest producing variety under any management treatment. The IRT mulch treatment produced the highest yield in all varieties. Both the IRT and the Remay row cover treatments, produced a higher percentage of marketable turnips to undersized or culls whereas the control produced a higher percentage of cull and undersized turnips. When the

entire crop was combined, it produced 16,683 kg/ha of marketable turnips, which at a selling price of $0.66kg would have yielded $11,010/ha, before expenses.

Cereal Maturity Trials

The purpose of this trial is to compare the growth and yield of wheat, barley and oats grown in southern Yukon, to the growth and yield of the same crops grown in central Yukon using the same crop inputs. The central Yukon trial, conducted from 1995 to 1998, demonstrated the need for irrigation to produce grain on a consistent basis (Hill and Sproule 1999). The trial initiated in 1999 in southern Yukon was also conducted under irrigated conditions. Early maturing varieties of grain were used and seeding was done as early as weather permitted to determine how consistently grain could be matured in the cooler southern climate.

Oats at the Takhini Test Plot August 2001

The summer of 2001 provided over 20% fewer growing degree days at the the Takhini test site than the growing degree days recorded at the test site in Carmacks, located in the central Yukon. The agroclimate rating at the Takhini test site was class 5 in 2001 which is one class below the normal requirement for spring seeded cereal grains. Despite the agroclimate capability rating, both barley and oats matured and showed positive economic returns.

FIELD 2: BARLEY

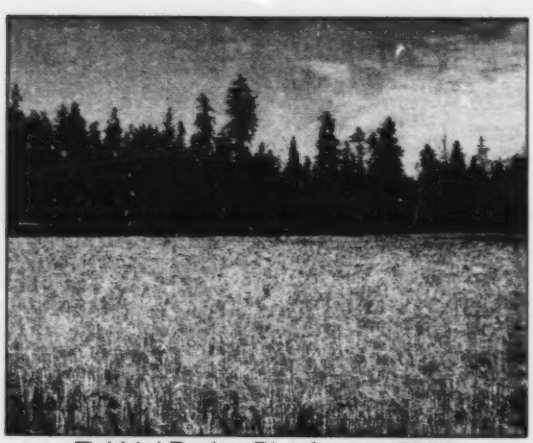
The barley plot was seeded on May 4th which was as soon as the ground could be worked this year. The crop was irrigated for the first time on May 16th and then only once more in mid-June. Germination occurred by May 22nd. On June 20th, 2-4D herbicide was applied to the plot with ground spraying equipment in an attempt to control an infestation of narrow leaf hawksbeard (*Hieracium scabriusculum)* and other broadleaf weeds. This spraying date was 7 days earlier than in 2000, at the same stage of crop growth, which was in keeping with the earlier seeding date. As in previous years, the herbicide was effective on all the broadleaf weeds with the exception of the hawksbeard, which was stunted but not killed.

Table 7
Grain Trial – Barley

Plot Design	35 x 40 m
Seedbed Preparation	Spring rototilling
Fertilizer Application	82-41-36 kg/ha (73-37-32 lb/ac)
Seeding Rate	88 kg/ha (79 lb/ac)
Seeding Method	Precision Plot Seeder
Seeding Date	May 04, 2001
Seed Variety	AC Albright
Soil Test Date	September 24, 2001
pH	6.7 – neutral
Organic Matter	1.8% – low

The barley seeded was a six row general purpose variety named "AC Albright" (see Appendix B). This variety was noted for its early maturity and was recommended for our area by both Alberta Agriculture and the University of Alaska, Fairbanks. The seeding rate was 88 kg/ha and fertilizer was applied according to soil test results. Soil samples were taken from each plot the previous fall.

The barley crop was grown for 132 days from time of seeding to time of sampling, which occurred on September 13th. Crop conditions were ideal for harvesting due to warm, windy nights, low humidity and day-time temperatures hitting 15°C. The crop was randomly sampled twice using a 0.5 m^2 frame. The barley grain was dry enough to store directly and when the samples were weighed, produced 4100 kg/ha or 76 bushels of grain per acre (see Table 8).



Takhini Barley Plot August 2001

Table 8
2001 Barley Harvest Results – Cost and Return Summary

Cost:	
Seed Cost	$46.95/ha
Fertilizer	$151.50/ha
Operating Costs (labour, depreciation, irrigation)	$407.72/ha
Herbicide	$37.07/ha
Total Cost	$643.24/ha
Return:	
Marketable Harvest	4.1 tonne/ha
Selling Price	$298.00/tonne
Gross Return	$1221.80/ha
Net Return (Loss)	$578.56/ha

FIELD 3: WHEAT

The wheat plot was seeded on May 4th and irrigated for the first time on May 23rd (see Table 9). Approximately 100 mm of irrigation water was applied in two sets once in mid-June and once at the end of that month. On June 20th, 2-4D herbicide was applied to the plot with ground spraying equipment in an attempt to control an infestation of narrow leaf hawksbeard (*Hieracium scabriusculum*) and other broad leaf weeds. Results were the same as reported in the barley plot.

Table 9
Grain Trial – Wheat

Plot Design	35 x 40 m
Seedbed Preparation	Spring rototilling
Fertilizer Application	82-41-36 kg/ha (73-37-32 lb/ac)
Seeding Rate	88 kg/ha (79 lb/ac)
Seeding Method	Precision Plot Seeder
Seeding Date	May 04, 2001
Seed Variety	Roblin
Soil Test Date	September 24, 2001
pH	7.0 – neutral
Organic Matter	1.8% – low

The variety of wheat seeded was a hard red spring type named "Roblin" (see Appendix B). Characteristics of growth are early maturity, good growth with strong straw and a high protein grain. Seeding rate was 88 kg/ha, and fertilizer was applied according to soil test results from the previous fall.

The wheat grain never reached a reasonable level of maturity and would have probably only been harvested for straw or plowed under. Sampling occurred on September 13th when frost had stopped any further ripening. The grain harvested was very poor seed quality although it would have been fine for feed. It would

have also required drying if it was to be stored and not kept in a frozen state. Yields were poor at 1750 kg/ha or 26 bushels per acre (see Table 10).

Table 10
2001 Wheat Harvest Results – Cost and Return Summary

Cost:	
Seed Cost	$50.04/ha
Fertilizer	$151.50/ha
Operating Costs (labour, depreciation, Irrigation)	$407.72/ha
Herbicide	$37.07/ha
Total Cost	$646.33/ha
Return:	
Marketable Harvest	1.75 tonne/ha
Selling Price	$310.00/tonne
Gross Return	$542.50/ha
Net Return (Loss)	$(-103.83)/ha

FIELD 4: OATS

The oat plot was seeded on the same day as the other cereals, May 4th (see Table 11). Irrigation began on this plot on May 24th and ended on June 20th with three sets of water being applied at approximately 40 mm per set. MCPA amine herbicide was applied on June 20th. Results were similar to the 2-4D applications on the barley and wheat in that the pineapple weed and lambsquarters were controlled but not the narrowleaved hawksbeard.

Table 11
Grain Trial – Oats

Plot Design	35 x 40 m
Seedbed Preparation	Spring rototilling
Fertilizer Application	82-41-36 kg/ha (73-37-32 lb/ac)
Seeding Rate	80 kg/ha (71 lb/ac)
Seeding Method	Precision Plot Seeder
Seeding Date	May 04, 2001
Seed Variety	AC Mustang
Soil Test Date	September 24, 2001
PH	7.2 – neutral
Organic Matter	1.8% – low

The variety of oats planted was "AC Mustang" (see Appendix B). This is the fourth year of trials with this variety in different areas of the Yukon. Yields in both forage and grain production trials in Alberta were as much as 117% of the "Cascade" variety, which had been the best producing oat in previous Yukon Crop Trials. Our results have been mixed. Although Mustang produced a taller crop, producers reported the greenfeed to be less palatable to horses. So far,

grain production appears to be inconclusive, with quality and yield being widely variable.

By the end of August, the oat grain was 90 – 95% mature in the soft to medium dough stage of maturity. Sampling occurred on September 13th when no further ripening was likely to occur. Yields were higher than last year in this area, high enough to be profitable at 5600 kg/ha or 142.5 bushels of grain per acre (see Table 12).

Table 12
2001 Oat Harvest Results – Cost and Return Summary

Cost:	
Seed Cost	$41.39/ha
Fertilizer	$151.50/ha
Operating Costs (labour, depreciation, irrigation)	$407.72/ha
Herbicide	$37.07/ha
Total Cost	$643.24/ha
Return:	
Marketable Harvest	5.6 tonne/ha
Selling Price	$302/tonne
Gross Return	$1694.22/ha
Net Return	$1056.54/ha

SMALL FRUIT TRIALS

INTRODUCTION

The summer of 2001 marked the fourth growing season for the raspberry variety trial and the second year of a new trial to test the growth of six strawberry varieties. The cooperators in the trial are interested in determining the commercial viability of each variety and what soil amendments can be made on this particular site to optimize crop production. Monitoring of soil reaction to the various amendments combined with on site weather data will help to assess environmental factors in variety performance. In the long term, practical data on the commercial production of raspberries and strawberries in the Yukon's main agricultural belt will be available to the industry.

SITE DESCRIPTION

Both the strawberry and raspberry trials are located on a gently sloping, south facing terrace within 225 meters of the Takhini River. Soils at the trial site are mainly silt/loam, pH is alkaline, averaging above 8.0, and salinity levels range from moderately saline (electrical conductivity (EC) 4-8 dS/m) in the spring to slightly saline (EC 1.5 dS/m) later in the summer.

Temperatures at the site in the summer of 2001 were pretty average for the Takhini River valley. May temperatures were below normal, while June, July and August were slightly above normal. A total of 874 effective growing degree days were recorded for the 2001 summer.

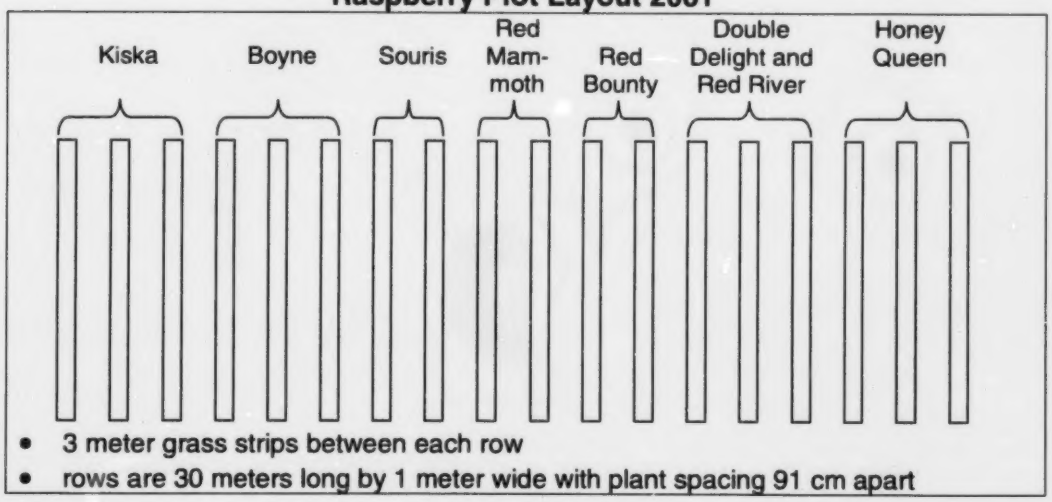
A five centimeter (2 inch) electric pump is used to deliver water 225 m to the test site through a five cm (2 inch) polyethylene mainline. Water is distributed to each row through drip lines from the main.

RASPBERRY VARIETY TRIALS

The summer of 2001 marks the fourth year in a five year trial to assess the commercial viability of eight raspberry varieties. Varieties included Boyne and Souris, two Agriculture Canada varieties widely grown in the west; Red River and Double Delight, two primocane varieties recently released by Agriculture Canada; Kiska, a native cross developed in Alaska; Honey Queen, a yellow raspberry from Rocky Mountain House in Alberta; and Red Mammoth and Red Bounty developed by the University of Saskatchewan (see Appendix C). Plant spacing was 0.91 m (3 feet) between plants in 0.91 m (3 feet) wide rows, with 3 m (10 feet) grassed mowing strips between the varieties. A total of 18 rows were planted (see Figure 2).

In 2001, the Red River primocane variety was consolidated from three rows to half a row in the trial due to poor performance. Souris was also scaled back from three rows to two, largely to make way for the introduction of two new varieties. SK Red Mammoth and SK Red Bounty are new introductions from the Department of Plant Science at the University of Saskatchewan with yield and winter hardiness traits worth investigating in our trial (see Appendix C).

Figure 2
Raspberry Plot Layout 2001


Kiska
Boyne
Souris
Red Mam-moth
Red Bounty
Double Delight and Red River
Honey Queen
• 3 meter grass strips between each row
• rows are 30 meters long by 1 meter wide with plant spacing 91 cm apart

During site preparation in 1998, an attempt was made to lower soil pH using 0-0-0-90s, sulphur granules. Soil tests taken that fall and again in the spring of 1999 revealed no change in pH. The lack of acidification at this site can be explained by the presence of free lime (calcium carbonate) which counteracts the acidification caused by the sulphur granules. Consequently, soil pH was not reduced as hoped, and some of the plants (Honey Queen in particular) displayed nutrient deficient symptoms consistent with alkaline soil conditions.

For the past two years, a more localized approach to lowering soil pH and delivering nutrients to the plants was taken. Soil acidifying liquid fertilizers have been applied in May each year, followed by alternating foliar, then soil applications of a complete liquid fertilizer throughout the growing season. Soil test results from May 17th revealed optimum fertility levels, a pH of 7.9 and low soil salinity at 1.92 EC(d/Sm).

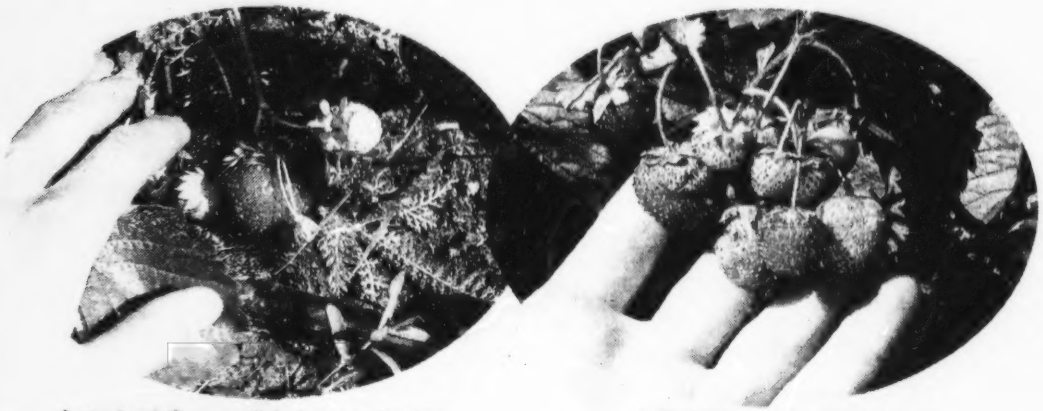
On August 8, the variety assessment was conducted. Kiska displayed the most plant vigour, both in terms of plant growth and as the only variety to produce a small commercial harvest. The Boyne variety slipped to second place this year due to the extensive winterkill of the previous years growth. Boyne was second best in terms of vegetative re-growth. Of the primocane varieties, Red River never thrived or produced fruit in the trial, as a result Red River was dropped from the commercial trial in 2001. Double Delight will stay in the trial as it continues to show good vegetative growth, but has not yet produced mature fruit on first year canes in the southern Yukon. Souris was consolidated from three rows into two in 2001 as it ranks third in vigour for the floricane varieties and room needed to be made for two new varieties. Honey Queen was the only other variety to produce fruit in 2001 although it was late to mature and yielded about 10% of the Kiska harvest. SK Red Mammoth and SK Red Bounty were added to the trial this year and they will be evaluated starting in 2002.

Strawberry Variety Trial

Of the six varieties of strawberries selected for trial on this site, five are commercially grown in other parts of Canada and the other variety, Toklat, is grown in Alaska. Input on trial design and mulching techniques was provided by a commercial producer near Fairbanks, Alaska.

The site selected for the trial is located 15 m to the west of the established raspberry orchard. Through May, the site was cleared and rototilled in preparation for planting. On June 1st 2000, twelve planting rows, 26 meters in length by one meter wide, were laid out with three meters between each row to facilitate mechanical weed control. Following the installation of drip irrigation lines, a one meter wide infrared transmissive plastic mulch (IRT) was laid over each planting bed . The wave selective mulch was designed to allow soil warming while eliminating certain spectrums of light so that it was also effective at controlling weed growth. This mulch, widely used in Alaska, also provided a clean surface for the berries to develop on. Strawberry plants were then manually

transplanted in the center of each row 45 cm (18 inches) apart, using bulb planters to cut through the mulch.

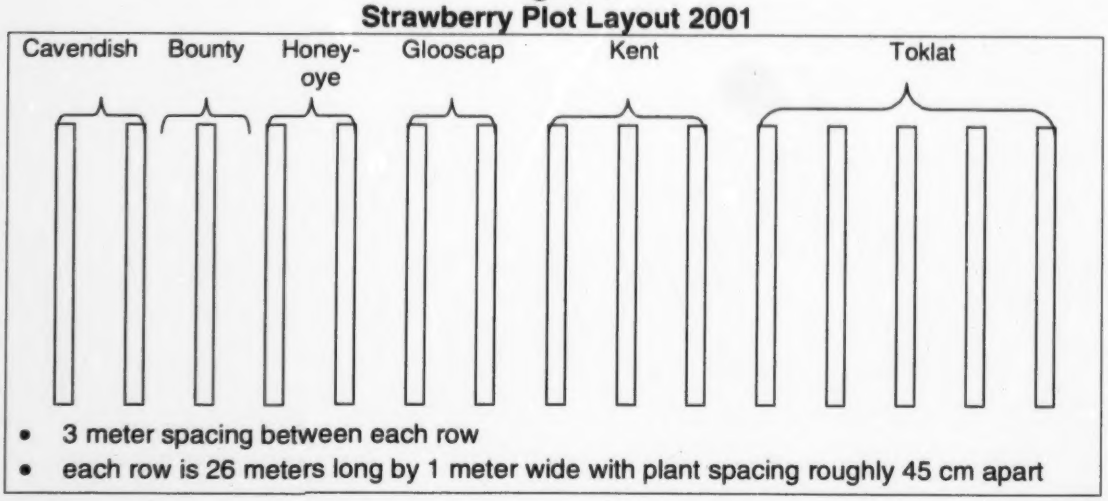


A typical Cavendish berry cluster with a couple of larger berries

A Toklat cluster with small to medium sized berries

Within three weeks of transplanting, several of the transplants had died or were showing signs of stress. It was determined that some of the planting stock may have been dehydrated prior to transplanting and would have taken better if it had been re-hydrated before setting in the field. Replacement plants were ordered and used to fill in gaps in the rows in May 2001. An additional four rows of Toklat were also added to the trial (see Figure 3). The replacement transplants each received ½ liter of 10-52-10 liquid fertilizer after planting while the second year plants received an application of 21-7-7 acidifying liquid fertilizer. A liquid fertilizer program was followed through the summer including foliar application and fertigation through the drip lines.

Figure 3
Strawberry Plot Layout 2001



- 3 meter spacing between each row
- each row is 26 meters long by 1 meter wide with plant spacing roughly 45 cm apart

Excessive weed growth under the IRT mulch led to removal of the mulch on a number of rows to allow manual cultivation. The mulch removal also made it easier for the runners to set. A post planting herbicide will be tested to control new weeds before the mulch is replaced.

The Alaskan variety "Toklat" started to flower as early as June 5th on second year plants. Toklat also produced the most vigorous growth, the most runners and the most fruit through the 2001 season. The Toklat fruit was small in comparison to other cultivars in the trial. Picking began on July 19th on Toklat, Kent and Cavendish and continued until hard (-1.9°C) frost on August 24th (see Table 13). Quantitative fruit assessments will begin in the 2002 season.

Table 13
Small Fruit Trials Temperature Data

Climate Factor	May	June	July	August	Total
Max Temp (°C)	16.8	25.6	31.9	30.3	
Min Temp (°C)	-6.5	-2.4	0.7	-1.9	
Daily Mean (°C)	5.9	12.5	13.3	12.9	
30 Year Normal	6.7	12.0	14.1	12.5	
Growing Degree Days (>5°C)	22.3	224.3	249.9	243.8	740.2
Effective Growing Degree Days	26.3	264.3	294.9	287.7	873.5 *
Frost Free Period (0°C)		June 27	→	Aug 17	51 days
Killing Frost Free Period (-2.2°C)		June 08	→	Sept 3	86 days

* The temperature factor is adjusted upward by 18% to account for the boost plants receive from the long hours of daylight north of 60° latitude.

References

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Tarnocai, C., Smith, C.A.S., and Beckman, D. 1988. Agriculture potential and climate change in Yukon. *In* Proceedings of the Third Meeting on Northern Climate, September 7-8, 1988, Whitehorse, Yukon. Atmospheric Environment Service, Environment Canada, Downsview, Ontario, pp. 181-196.

Useful Internet References

Alberta Agriculture
http://www.agric.gov.ab.ca

Agriculture and Agri-Food Canada
http://www.agr.ca

BC Agriculture
http://www.gov.bc.ca/agf/

University of Alaska Fairbanks
http://www.lter.uaf.edu

Appendix A

Potato Variety Descriptions

Norland – Released in 1957, this variety was developed by the North Dakota State University. Tuber shape is medium oblong with shallow eyes on a smooth, red skin with a white flesh. Plant is medium large with purple flowers. Maturity is early mid-season, storable rating is good.

Red Pontiac – Released in 1983 by the USDA. This is a late season variety with round to oblong tubers with a dark red skin which may sometimes be netted. Tubers have medium to deep eyes with white flesh. Plants are large, slightly spreading with thick stems that are prominently angled. It is susceptible to most common potato diseases. It generally has good storage properties with a medium to long dormancy. It is susceptible to bruising and is reported to have some tolerance to drought.

Rutabaga/Turnip Variety Descriptions

Early Snowball – Produces an egg shaped creamy white flesh tuber with a white skin. A sweet, early variety that matures in 40-45 days.

Purple Top – Produces firm, crisp, milky-white roots with a purple top and a sweet mild-flavour. This is a mid-season variety requiring 55-60 days to maturity.

Laurentian – Produces a globe-shaped creamy-yellow quality flesh. A late variety that matures in 80-90 days.

Appendix B

Grain Variety Descriptions

Barley – AC Albright – Developed in 1992 by Agriculture Canada at the Beaverlodge Research Farm. AC Albright is a six-row, general purpose feed barley. The strengths of this barley are that it is slightly higher yielding than Otal and has good kernel weathering ability at harvest. Weaknesses are a shallow root system susceptible to root rot, and a straw strength equal to Otal. This variety is distributed by SeCan and Alberta Seed Growers.

Barley – Otal – Developed in 1981 by the USDA-ARS in Alaska. It is a six-row, feed barley. Tests in Alaska yielded 72-77 bushels/acre.

Oats – AC Mustang – Developed in 1994 by Agriculture Canada at the Lacombe Research Centre and Beaverlodge Research Farm. It is a feed/silage oat. Strengths of this variety are yields 5-7% more than Cascade, good silage yield, lodging resistance and test weight. It has a high percent plump kernels and low percent thin kernels. Weaknesses are it has a high hull content - not a milling oat and is susceptible to crown and stem rust. Distributed by Agricore and Alberta Seed Growers.

Wheat – AC Minto – Developed in 1991 by the Cereal Research Centre in Winnipeg, Manitoba. It is a Hard Red Spring Wheat. Strengths of the grain are very good leaf and stem rust resistance, high yield, larger seed size, and good loose smut and bunt resistance. It is similar to Neepawa and Katepwa, but one half day later in maturity and taller with no straw strength improvement. This seed is distributed by SeCan.

Wheat – Roblin – Developed in 1986 at the Cereal Research Centre in Winnipeg, Manitoba. It is a Hard Red Spring Wheat. Strengths of the grain are early maturity combined with good yields, strong straw, good rust resistance, and high protein. The weaknesses are susceptibility to common bunt, common root rot, and septoria leaf blotch. This seed is distributed by SeCan.

APPENDIX C

Raspberry Variety Descriptions

Boyne – Developed at the Agriculture Canada Research Station at Morden, Manitoba and introduced in 1960, it is a combination of Chief and Indian Summer. It is the hardiest and most consistently productive cultivar for the Prairies; and the main cultivar for commercial production in all colder regions of Canada and the United States. Canes are medium in height, thick, erect and stocky, with many lateral branches. Fruit is medium sized, dark red, firm, juicy, aromatic and tart.

Double Delight – Developed by Agriculture Canada Research Station, Morden Manitoba, it is a combination of Fall Red, native primocane fruiting type, Cheyenne, Wyoming, Fall Red, and Boyne. Double Delight canes are stout with sparse, short spines and grow to a height of 5 feet. The medium red berries are sweet, tart and excellent.

Honey Queen – Introduced by Robert Erskine from Alberta's Rocky Mountain House in the mid-sixties. It is the hardiest of the yellow raspberries. It has good-sized, aromatic berries that have a mild but entirely different flavour than the red berries. The berries are considered soft, and poorly suited to freezing and processing, but are excellent fresh.

Kiska – Developed by Dr. Arvo Kallio at the Agricultural and Forestry Experiment Station, Fairbanks Alaska. Kiska raspberries have thin, willowy canes. Under optimum fertility and moisture, canes may easily reach 6-8 feet in height. These canes tend to bend outward and downward making harvesting difficult.

Red River – Selected in 1978 at the Agriculture Canada Research Station, Morden Manitoba, it is a combination of Fall Red, native primocane fruiting type, Cheyenne, Wyoming, Fall Red, and Boyne. Red River fruits earlier than other selections tested. It has medium red berries that are sweet, tart and good. Canes are relatively short and stout with sparse short spines, and grow to a height of 3.5 feet.

Souris – Developed by Agriculture Canada Research Station, Morden Manitoba. An improved selection of Boyne because it is better tasting, a heavier producer of fruit and it has 15% better spider mite resistance.

SK Red Mammoth – Developed by the Department of Plant Science at the University of Saskatchewan, it is a variant of Muskoka. It is a large-fruited, red raspberry with yields similar to Boyne, but with longer shelf life.

SK Red Bounty – Developed by the Department of Plant Science at the University of Saskatchewan, it is a combination of Trent and Fraser. It is superior to Boyne in both yeild and winter hardiness. The berries show good resistance to skin injury.

Appendix D

Strawberry Variety Descriptions

Bounty – Developed in 1972 by Agriculture Canada, it is a cross between Jerseybelle and Senga Sengana. Produces medium to high yields of dark red berries which have a very good flavour when fully ripe. King berries are large but size drops quickly for later fruit. Berries are medium firm and hull easily. Plants are susceptible to red stele (caused by the fungus *Phytophthora fragariae*) and green petal. Makes a jam with excellent flavour. Suited to Pick Your Own (PYO).

Cavendish – Developed by Agriculture Canada in 1990, it is a cross between Glooscap and Annapolis. This variety produces high yields of very large, medium firm to firm fruit. Flavour is good but berries are prone to excessive darkening when overripe and colour can be variable with white blotches evident under some conditions. Plants show low to medium vigour so planting densities should be increased. Resistant to red stele (A-6) but susceptible to powdery mildew and green petal. Suited to PYO or limited shipping.

Glooscap – Developed by Agriculture Canada in 1983, it is a cross between Micmac and Bounty. Produces high yields of medium to large, dark red fruit. Berries are medium firm with good flavour. Plants are vigorous and winter hardy. Susceptible to red stele (A-6) and green petal. Suited to PYO. Symptoms resembling June Yellows have been observed.

Honeyoye – Developed in 1972 by the New York State Agricultural Experiment Station, it is a cross between Vibrant and Holiday. Produces high yields of medium to large, attractive, medium firm berries which are prone to excessive darkening when overripe. Green tip may be observed, particularly on king berries. Honeoye produces ample pollen and has some tolerance to tarnished plant bugs and thereby consistently develops well formed fruit. Fruit flavour is variable and can be quite acid on some sites. Plants are vigorous and they runner well.

Kent – Developed by Agriculture Canada it is a cross between Redgauntlet, Tioga and Raritan. Produces very high yields of large, bright red fruit. Berry flesh is firm but skin may be weak in hot weather. Flavour is fair to good. Has shown some tolerance to red stele (A-6) in some fields. Suited to PYO and limited shipping. Kent is the most widely grown strawberry variety in eastern Canada.

Toklat – Developed in the 1960s by Arvo Kallio at the University of Alaska Experimental Station. It is a recommended perennial "June bearing" strawberry plant which are July-bearing in Fairbanks, Alaska for about two weeks. The strawberry will die if the temperature dips below –6.5°C, but a covering of snow will usually help insulate the plant. Other virtues of the perennial Toklat are its large size, firmness and pleasingly red hue. Toklats produce a lot of runners, which unless controlled will limit fruit production.